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Identification of shallow Al donors in Al-doped ZnO nanocrystals: EPR and ENDOR spectroscopy

Orlinskii S., Schmidt J., Baranov P., Lorrmann V., Riedel I., Rauh D., Dyakonov V.
Kazan Federal University, 420008, Kremlevskaya 18, Kazan, Russia

Abstract

Electron paramagnetic resonance and electron-nuclear double resonance (ENDOR) experiments on ZnO nanoparticles doped with Al reveal the presence of shallow, effective-masslike donors related to substitutional Al atoms. The shallow character of the Al donor is evidenced by the multitude of ENDOR transitions of the Z 67 n nuclear spins and by the hyperfine interaction of 1.45 MHz of the A 27 l nuclear spin, which is much smaller than for atomic aluminum. The electric-field gradients at the Al and Zn atoms are found to be nearly the same, which supports the contention that the Al atom is located at a Zn position. © 2008 The American Physical Society.

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